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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: Takashige IWAMURA et al.  
Application No.: 10/676,121  
Filed: October 2, 2003  
For: MULTI-SITE REMOTE-COPY SYSTEM  
Group: 2186  
Examiner: M. Padmanabhan

**REQUEST FOR RECONSIDERATION**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

May 31, 2005

Sir:

In response to the Decision on Petition dated April 28, 2005, reconsideration and withdrawal of the Decision is respectfully requested in view of the following remarks.

**REMARKS**

Initially, in the Decision on Petition dated April 28, 2005, the Examiner asserts that the Petition to Make Special filed January 27, 2005 is defective for failing to provide a detailed discussion of the references to the extent required by 37 C.F.R. §1.111(b) and (c) and for failing to identify with particularity the distinction between each independent claim and the disclosure of each cited of the references.

The present invention as recited in the claims filed are not taught or suggested by any of the above noted references whether taken individually or in combination with each other or in combination with any of the other references now of record.

The present invention as recited in the claims is directed, at a minimum, to a system that includes a computer and a storage subsystem, wherein the computer duplicates data and writes them into plural storage areas of the storage subsystem, and wherein the storage subsystem transfers content of data update into a first storage area among the plural storage areas, in which the data have been duplicated and written, to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and wherein the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas, in which the data have been duplicated and written, to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

It is submitted that the cited references, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to disclose or suggest where the storage subsystem transfers content of data update into a first storage area among the plural storage areas, in which the data have been duplicated and written, to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas, in which the data have been duplicated and written, to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed, and/or where the transfers are by synchronous and/or asynchronous remote copy, and/or wherein a storage subsystem transfers update data into the first storage area and update data into the second storage area to a second storage subsystem connected to the storage subsystem by a synchronous remote copy, and/or writing a log of a database into a first storage area of a storage subsystem of the first site by a computer included in the first site and storing data of the database into a second storage area of the storage subsystem, and/or wherein the computer transfers a log of a database to a second computer connected to the computer, and/or transferring the log to a third site by the computer.

All of the independent claims recite at least one of these features or this feature, if there is only one. In particular, independent claim 1 recites wherein the

storage subsystem transfers content of data update into a first storage area among the plural storage areas, in which the data have been duplicated and written, to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and wherein the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas, in which the data have been duplicated and written, to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

Independent claim 5 recites transferring update data of the first storage area to the second site by a synchronous remote copy, and transferring update data of the second storage area to the third site by an asynchronous remote copy. Independent claim 13 recites wherein the storage subsystem transfers update data into the first storage area and update data into the second storage area to a second storage subsystem connected to the storage subsystem by a synchronous remote copy, and wherein the computer transfers the log of a database to a second computer connected to the computer. Independent claim 14 recites writing a log of a database into a first storage area of a storage subsystem of the first site by a computer included in the first site and storing data of the database into a second storage area of the storage subsystem of the first site, and transferring update data into the first storage area and update data into the second storage area to the second site by the storage subsystem using a synchronous remote copy; and transferring the log to the third site by the computer.

The references considered most closely related to the claimed invention are briefly discussed below:

**U.S. Patent Publication No. 2004/0024975 A1 (Morishita et al.)** discloses information about remote copy target volumes of other storage systems 2 each having one and the same original volume V1 is registered for each remote copy target volume in advance. When there occurs a failure in a copy source storage system 2, a copy source volume for remote copy target volumes using the storage system 2 having a failure as their copy source is selected newly from the registered copy source volumes, and remote copy is resumed. However, Morishita et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent Publication No. 2004/0153719 A1 (Achiwa et al.)** discloses an information processing system that includes three storage apparatuses installed on three sites for the purpose of disaster recovery. The three storage apparatuses can be accessed by three information processing apparatuses, respectively, that are

configured in a cluster. One of the storage apparatuses is set as a replication source and the other two storage apparatuses are set as replication destinations. The two storage apparatuses that are set as replication destinations manage a copy of data stored in the storage apparatus that is set as the replication source. In association with an execution of a failover on the information processing apparatus side, settings of the storage apparatuses as the replication source and replication destinations are automatically changed such that the storage apparatus that is set as the replication source would function as a replication destination, and one of the storage apparatuses that are set as the replication destinations would function as a replication source. However, Achiwa et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent No. 5,937,414 (Souder et al.)** discloses a method and apparatus for replicating data among sites that allows changes to the same body of data to be replicated synchronously to some destination sites and asynchronously to other destination sites. Such mixed propagation configurations allow synchronous updating to selected remote copies of replicated data where data integrity is a high

priority, and asynchronous propagation to remaining copies of replicated data in order to allow transactions to be committed locally regardless of whether the transaction is committed at a remote copy of the replicated data. The propagation mode is selectable by a user on a site-to-site basis for each replicated body of data, thus providing a mix of availability and consistency that is not possible in purely synchronous or purely asynchronous replication systems. However, Souder et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent No. 5,555,371 (Duyanovich et al.)** discloses primary and secondary data processing systems that are coupled via a communication system. Data storage in both systems is provided by a log structured array (LSA) system that stores data in compressed form. Each time data are updated within LSA, the updated data are stored in a data storage location different from the original data. Selected data recorded in a primary data storage of the primary system is remote dual copied to the secondary system for congruent storage in a secondary data storage, such as for disaster recovery purposes. The primary systems creates a

remote copying session. Within such remote copying session, a series of "pending write update" sessions are ESTABLISHED. All data updated within each pending write update session is a consistency group of data. Within each pending write update session update data are retentively stored in both the primary and secondary systems (such as in a non-volatile cache). Addressability of such update data within a pending write update session is through separate pending write directories. The main (primary and secondary) directory for data is not updated such that all original (not updated) data are addressable. A COMMIT command terminates each pending write update session. Congruence of the sequence of updating in the primary system is maintained in the secondary system updating procedure. However, Duyanovich et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent No. 5,615,329 (Kern et al.)** discloses a remote data shadowing system provides synchronous, storage based, real time disaster recovery wherein a secondary site is located remote from the primary site. An error recovery program at the primary site quiesces applications running thereat for performing error recovery



procedures and signaling both primary and secondary locations that failed duplex has occurred. The error recovery program determines the cause of failed duplex, and if error recovery is successful, duplex mode is resumed. If the error recovery program is unable to perform error recovery successfully, then further write updates at the primary site are prohibited and an error message is communicated to operators at both the primary and secondary sites. However, Kern et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent Nos. 6,477,627, 6,587,935 (Ofek)** disclose a data processing network including a local system and a geographically remote system. Each of the local and remote systems includes a data storage facility. The remote data storage facility mirrors the local data storage facility. In a normal operating mode, the local and remote systems operate in near synchronism or in synchronism. In an alternate operating mode, writing operations at the local system immediately update the storage devices in the local data storage facility. Transfers of corresponding data to the remote data storage facility are made independently of and asynchronously with

respect to the operation of the local system. However, Ofek does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent No. 6,813,683 (Tabuchi et al.)** disk subsystem assures the sequence and the coherence of data updating with two or more disk subsystems is provided with an asynchronous remote copy function. A main center includes a computer system having the configuration of slave subsystems connected with a master disk subsystem. It secures the coherence between data at the main center and the remote center at the temporary suspension by repeating temporary suspension and release of the temporary suspension of the remote copy by the master subsystem at predetermined opportunities. It also repeats temporary suspension and release of the temporary suspension of the remote copy by slave subsystems connected to it. However, Tabuchi et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem

transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**U.S. Patent Publication No. 2003/0200387 A1 (Urabe et al.)** discloses a synchronization confirmation method required for operation of a database is provided to a host device connected to a disk device which provides remote asynchronous data transfer. Immediately after commit of write data, an application of the host device issues a sync command which requires synchronization confirmation. A disk control device notifies the host device of a number concerning latest data received from the host device of a local side and a number concerning latest data received by a remote side. When the two numbers have coincided with each other, the host device judges the commit operation to have been completed. However, Urabe et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

**European Patent Application 1 283 469 A2 (Nakano et al.)** discloses two data centers located in the vicinity are connected using a synchronous transfer copy

function, and one of the data centers is coupled with a third data center disposed at a remote location by an asynchronous remote copying function. The order whereat a storage sub-system located in the vicinity has received data from a host is consistently guaranteed, and the third data center holds the data. Further, each storage sub-system includes a function whereby, during normal operation, data can be exchanged and the data update state can be obtained by the storage sub-systems located in the two data centers that do not directly engage in data transmission. However, Nakano et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed.

Therefore, since the references fail to disclose where the storage subsystem transfers content of data update into a first storage area among the plural storage areas, in which the data have been duplicated and written, to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area

among the plural storage areas, in which the data have been duplicated and written, to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed, and/or where the transfers are by synchronous and/or asynchronous remote copy, and/or wherein a storage subsystem transfers update data into the first storage area and update data into the second storage area to a second storage subsystem connected to the storage subsystem by a synchronous remote copy, and/or writing a log of a database into a first storage area of a storage subsystem of the first site by a computer included in the first site and storing data of the database into a second storage area of the storage subsystem, and/or wherein the computer transfers a log of a database to a second computer connected to the computer, and/or transferring the log to a third site by the computer, it is submitted that all of the claims are patentable over the cited references.

U.S. Application No. 10/676,121

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Mattingly, Stanger, Malur & Brundidge, P.C., Deposit Account No. 50-1417 (referencing attorney docket no. 566.43181X00).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.



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Frederick D. Bailey  
Registration No. 42,282

FDB/sdb  
(703) 684-1120